

PCGK - Pressure Case Gamma

[illegible]

WELL INFORMATION

MWD Run Number	100				
Date run completed	13-Aug-15				
Rig Bit Number	0200				
Bit Size (in)	8.750				
Tool Nominal OD (in)	6.750				
Log Start Depth (MD, ft)	775.00				
Log End Depth (MD, ft)	6,142.00				
Drill or Wipe	Drill				
Drill/Wipe Start Date and Time	12-Aug-15 22:35				
Drill/Wipe End Date and Time	13-Aug-15 17:10				
Min Inc (deg) @ Depth (MD, ft)	0.28 @ 1,039.00				
Max Inc (deg) @ Depth (MD, ft)	82.55 @ 6,087.00				
Bit TFA(in2) / Bit Type	0.98 / PDC				
Flow Rate (gpm)	577.94				
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A				
Fluid Type	Native/Spud Mud				
Density (ppg) / Viscosity (spqt)	9.10 / 28.00				
Filtrate CL (ppm)	2,400.00				
pH / Fluid Loss (mptm)	9.90 / 41				
PV (cP) / YP (lbf2)	3 / 2.00				
% Solids / % Sand	4.40 / 0.30				
% Oil / Oil:Water Ratio	N/A / N/A				
Rm @ Measured Temp (degF)	N/A @ N/A				
Rmf @ Measured Temp (degF)	N/A @ N/A				
Rmc @ Measured Temp (degF)	N/A @ N/A				
Max Tool Temp (in) Temp (degF)	122.00 / 221.00				

Max Tool Temp (degF) / Source	162.80 / PCM				
Rm @ Max Tool Temp (degF)	N/A @ 162.80				
Lead MWD Engineer	Robert Barnes				
Customer Representative	Jim Turner				

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM				
Software Version	5.93				
Sub Serial Number	11341339				
Insert Serial Number	11400992				
Date and Time Initialized	11-Aug-15 20:23				
Date and Time Read	13-Aug-15 22:15				
ECMB SW Version	N/A				

Directional Sensor Information

Tool Type	PCDC				
Distance From Bit (ft)	55.00				
Software Version	6.21				
Sub Serial Number	11341339				
Sonde Serial Number	11297516				
Sensor ID Number	N/A				
Toolface Offset (deg)	353.80				

Gamma Ray Sensor Information

Tool Type	PCG				
Distance From Bit (ft)	48.73				
Recorded Sample Period (sec)	10				
Software Version	8.15				
Sub Serial Number	11341339				
Insert/Sonde Serial Number	12037420				

REMARKS

1. All depths are calibrated to driller's pipe tally and are true vertical depth from the Drill Floor.
2. No depth corrections have been made for pipe stretch or compression.
3. Critical annular velocities are calculated using the "Power Law" model for water based fluids and the "Brigham Plastic" model for oil and synthetic based fluids.
4. All data presented is recorded data unless otherwise specified.
5. The following smoothing parameters have been applied to the data:
 - 1:600 Log
PGRC (Gamma CG) and ROPA (Average Rate of Penetration)
Interval Resolution: 1.0 ft
Interval Distance: 3.0 ft
 - 1:240 Log
PGRC (Gamma CG):
Interval Resolution: 0.5 ft
Interval Distance: 0.6 ft
 - ROPA (Average Rate of Penetration):
Interval Resolution: 0.5 ft

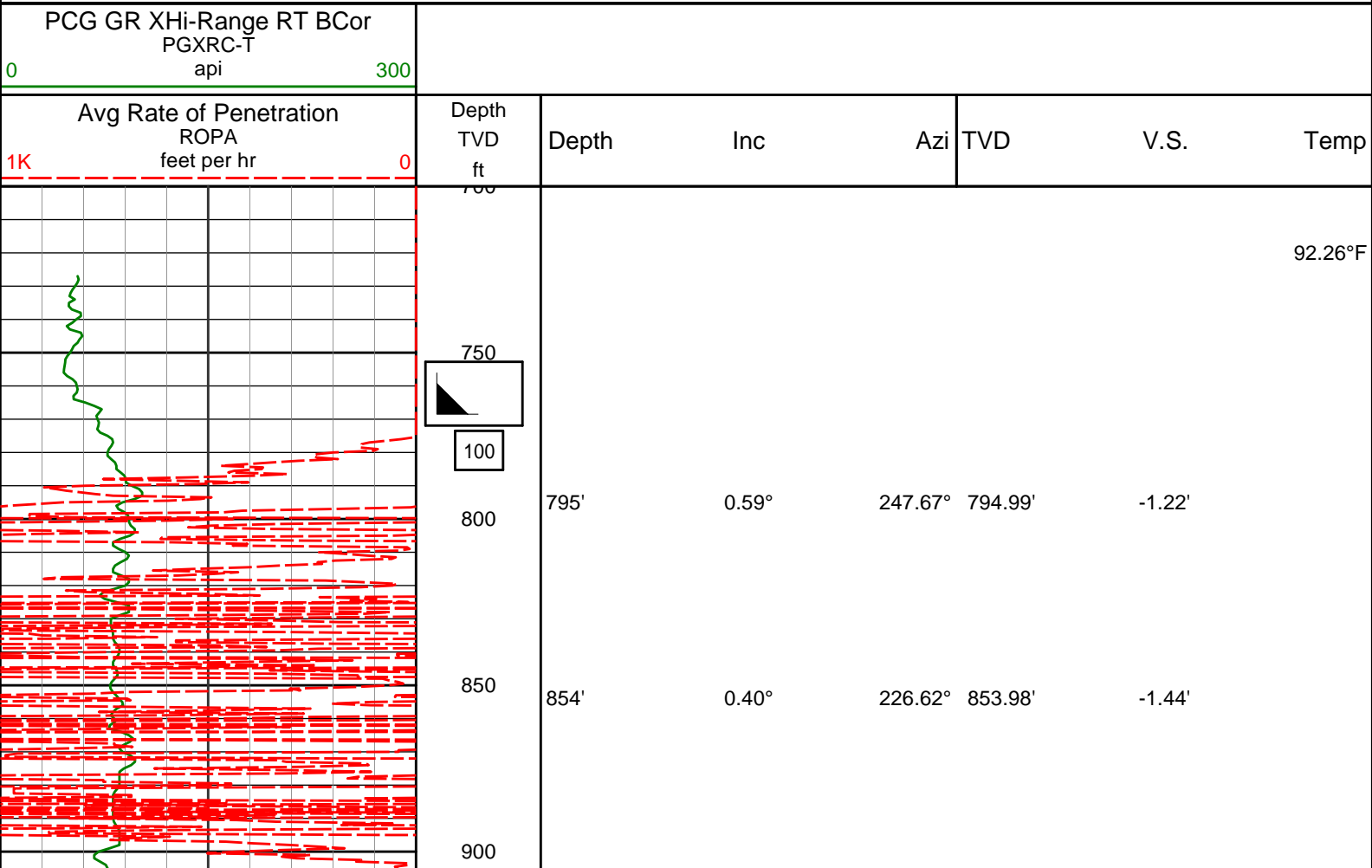
Interval Resolution: 1.2 ft

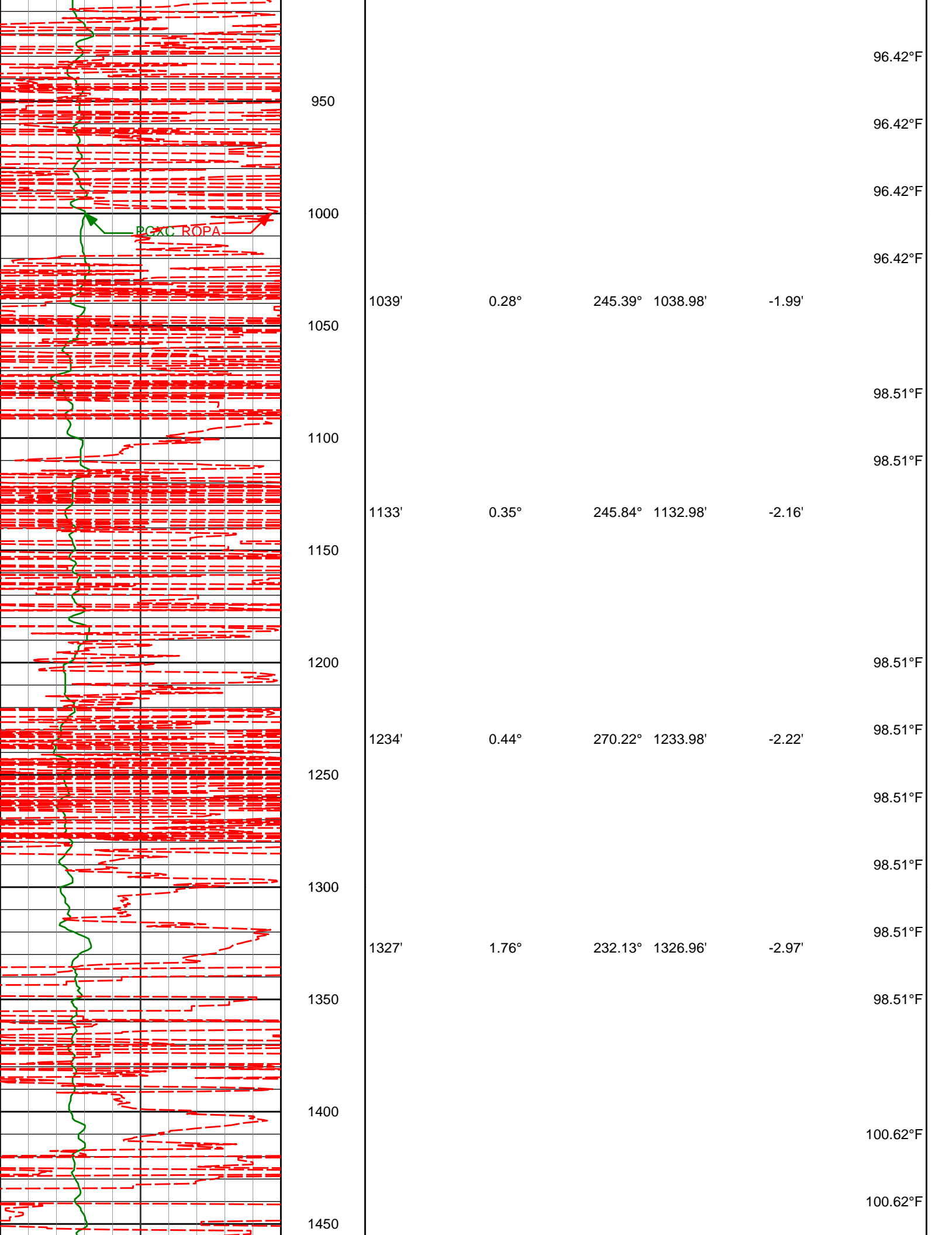
6. Insite Version v8.3

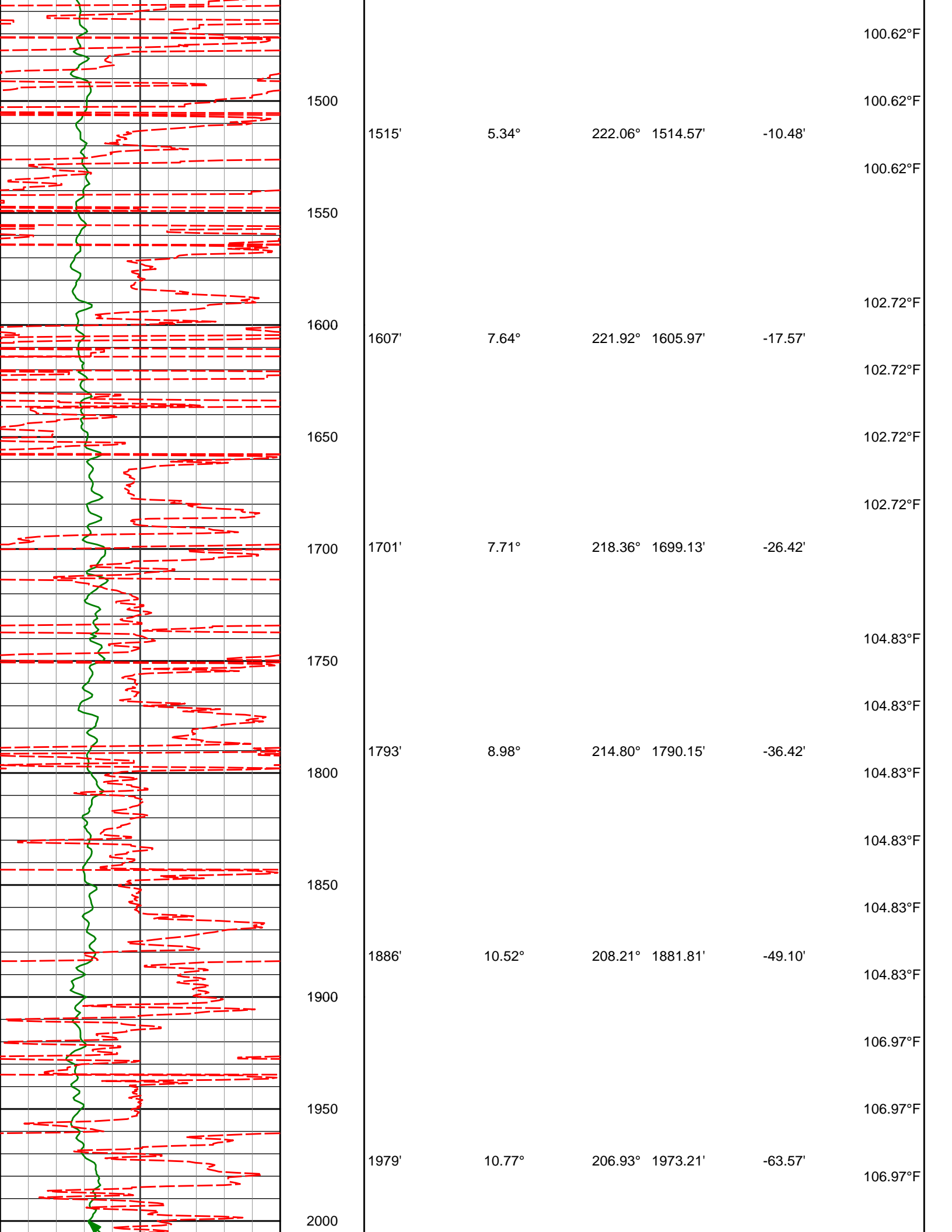
WARRANTY

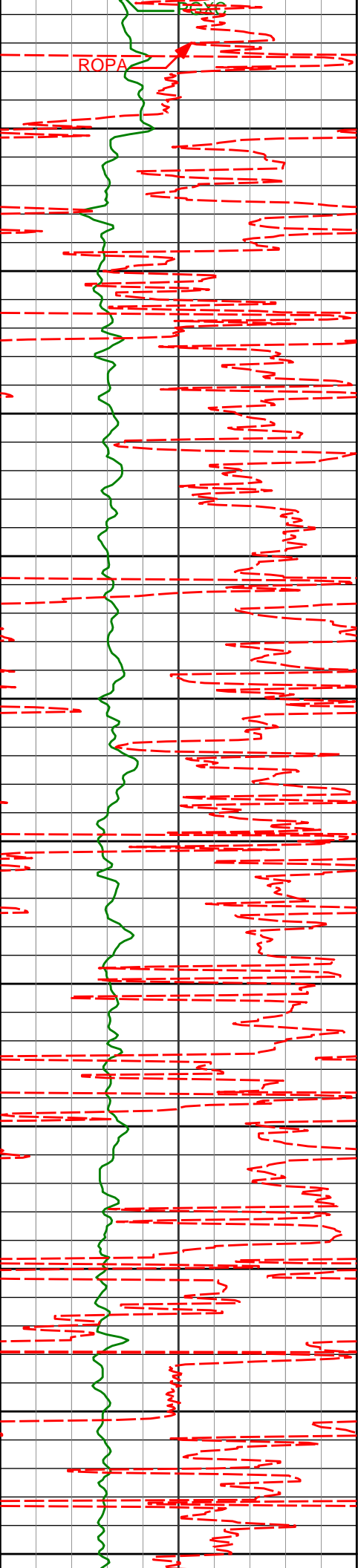
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TVD Detail 1:600 Scale









2050
2100
2150
2200
2250
2300
2350
2400
2450
2500
2550

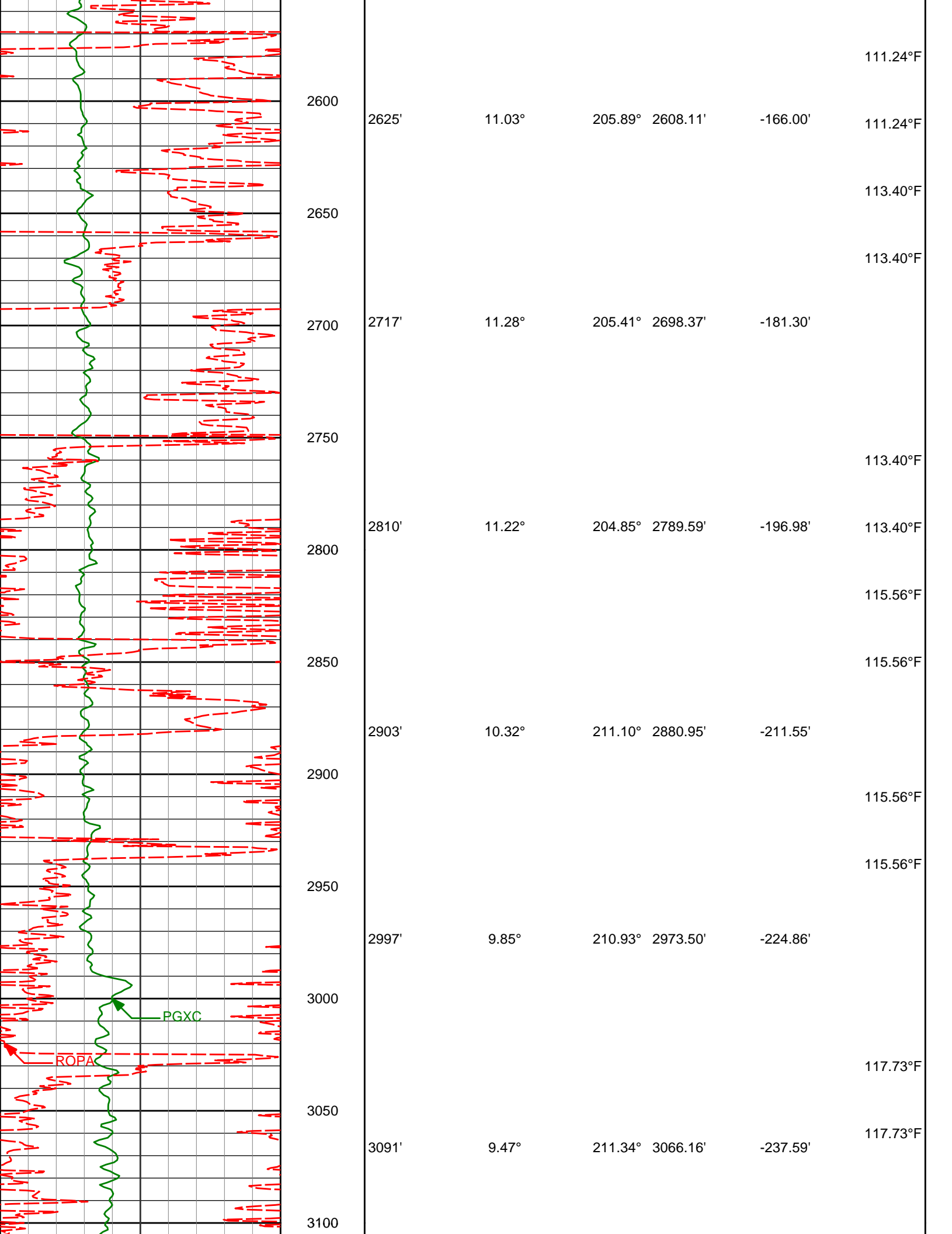
2071'
2163'
2256'
2441'

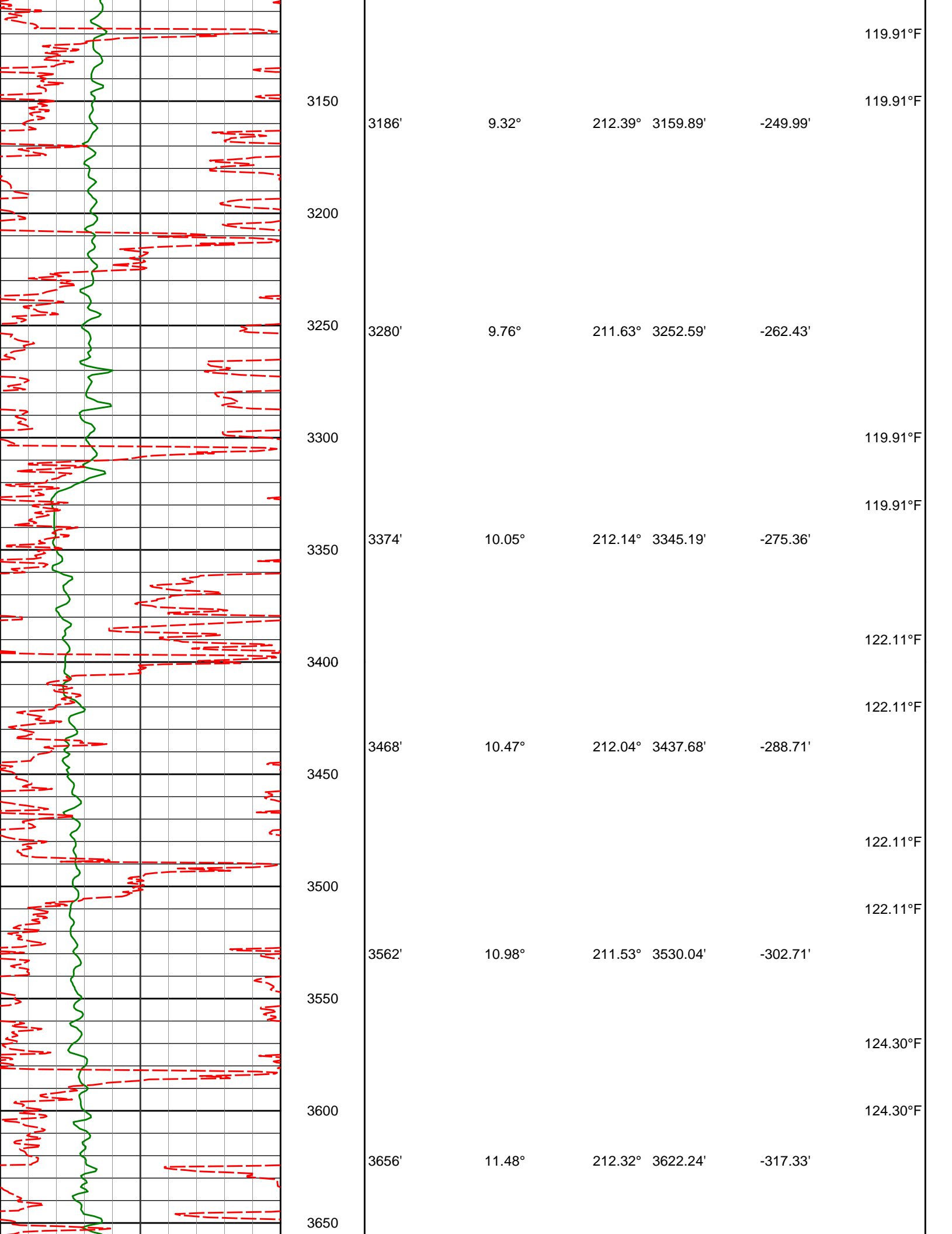
10.67°
10.80°
10.55°
10.37°

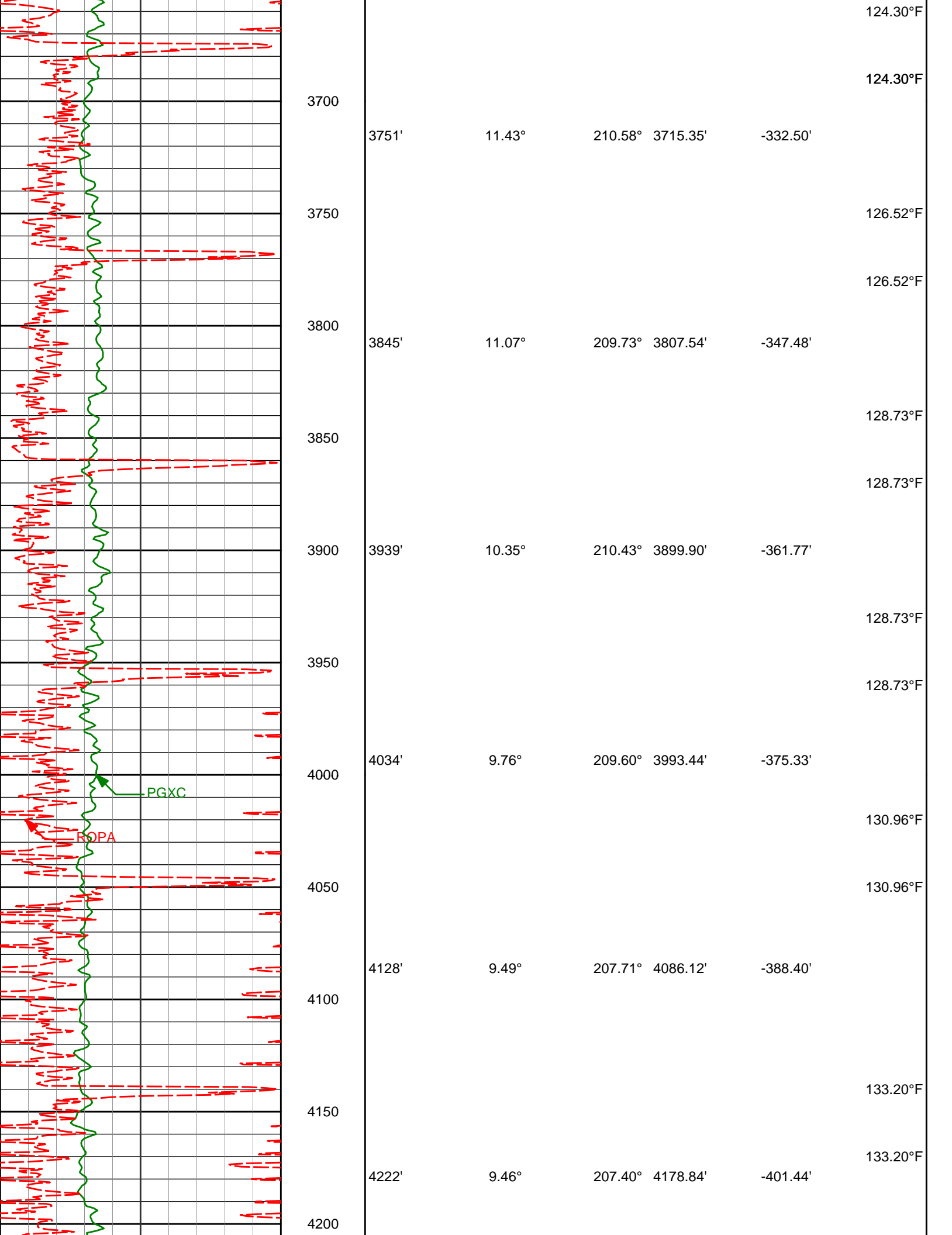
206.76° 2063.60'
205.73° 2153.99'
205.24° 2245.39'
205.17° 2427.31'

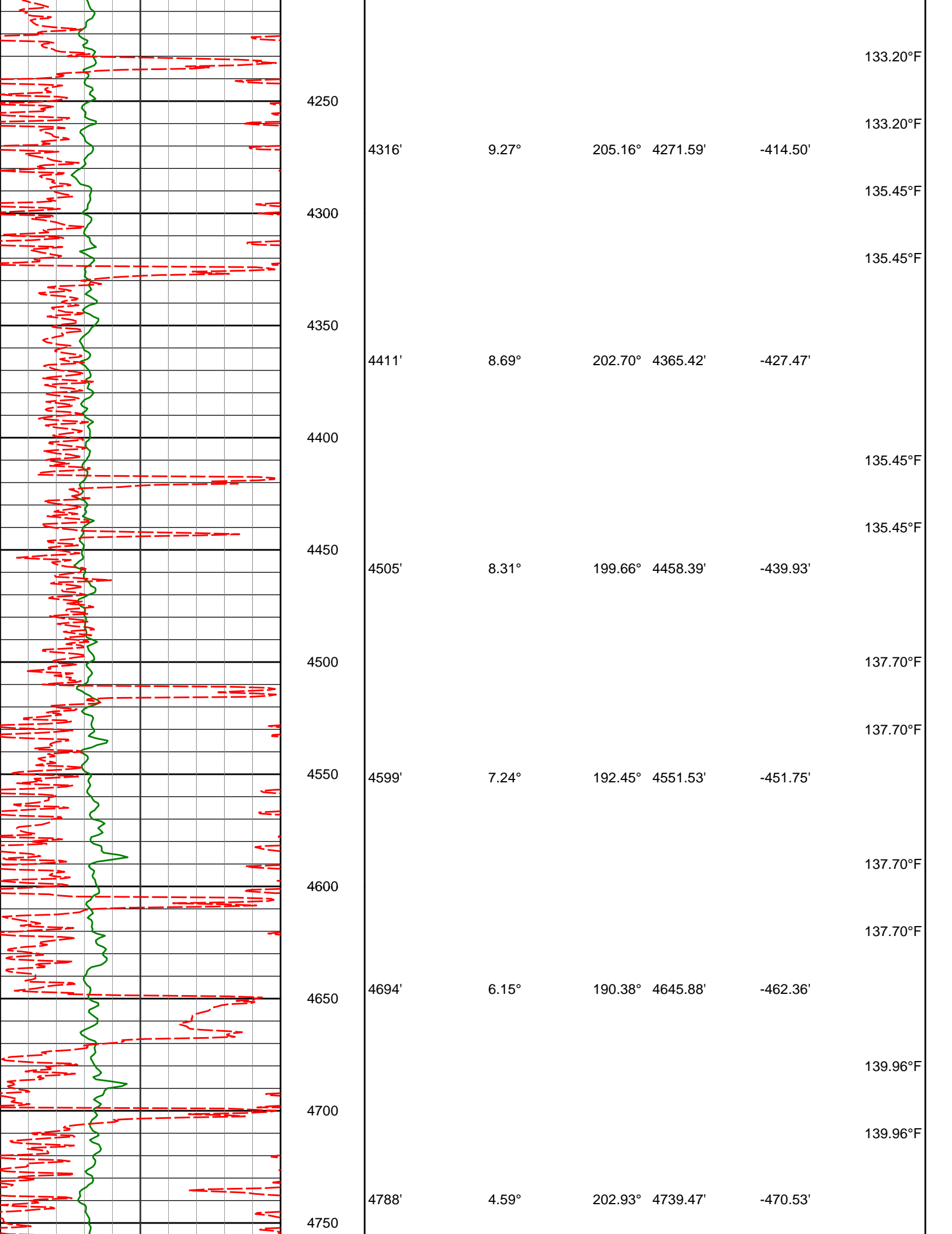
-78.10'
-92.74'
-107.57'
-136.59'

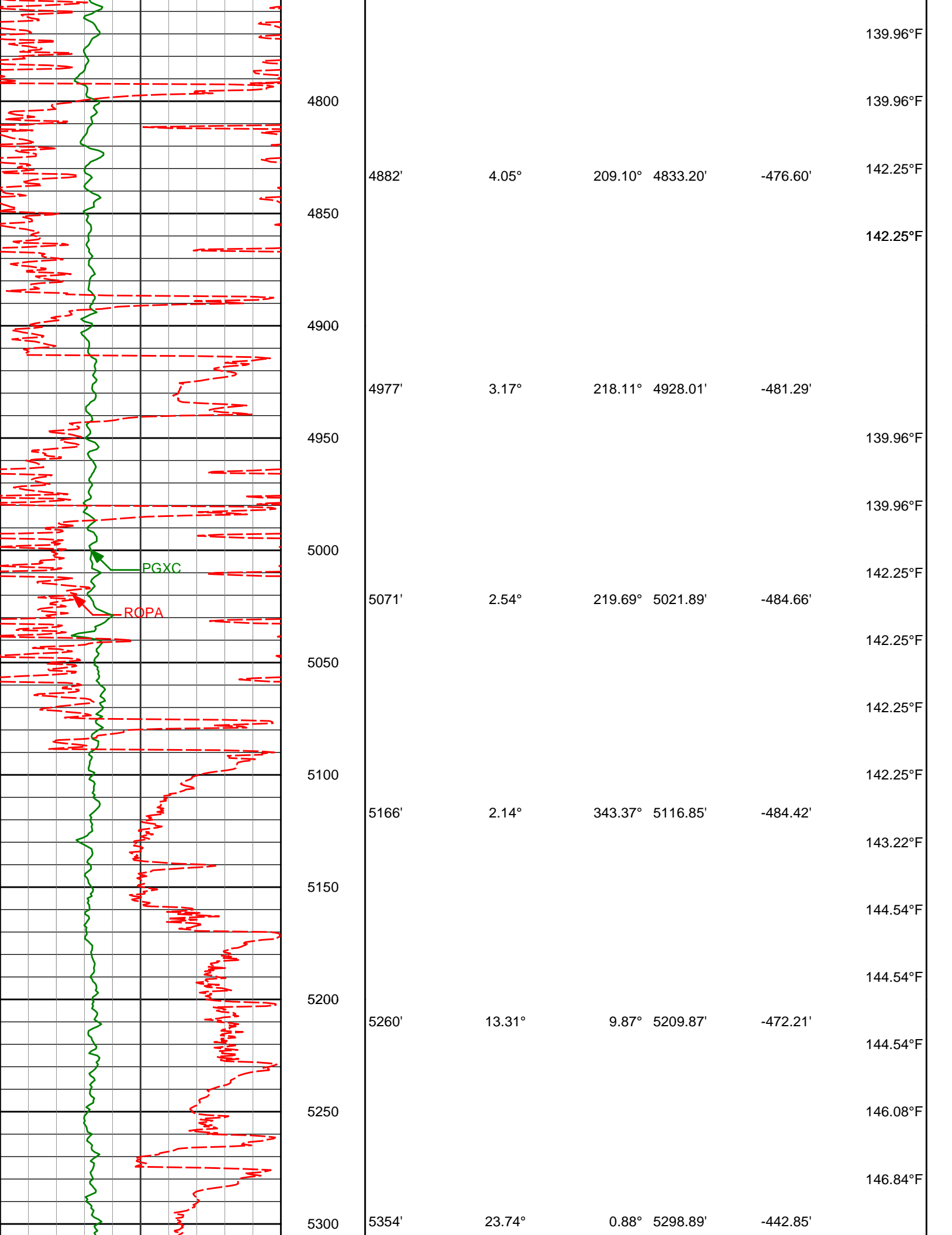
106.97°F
106.97°F
109.09°F
109.09°F
109.09°F
109.09°F
111.24°F
111.24°F
111.24°F
111.24°F

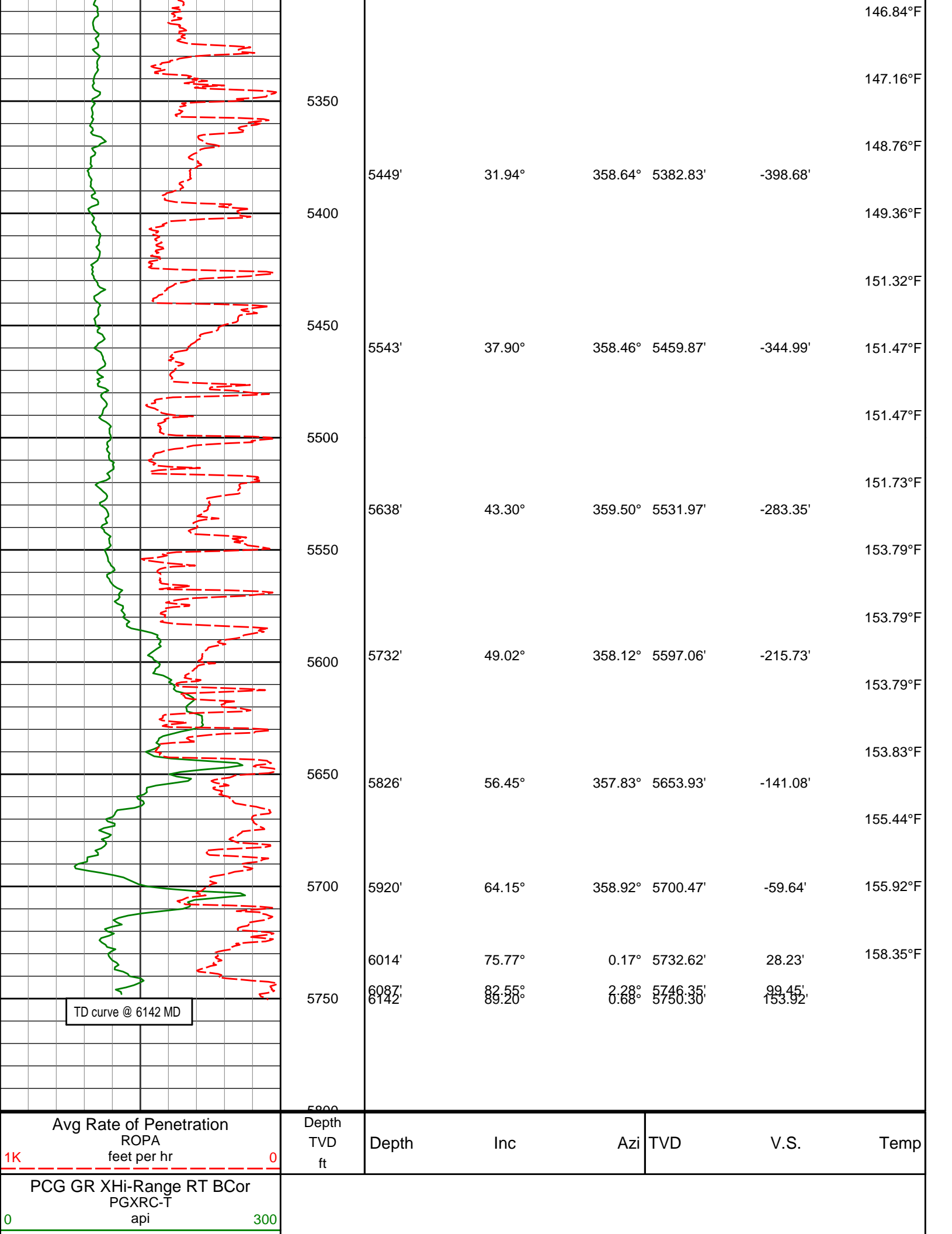




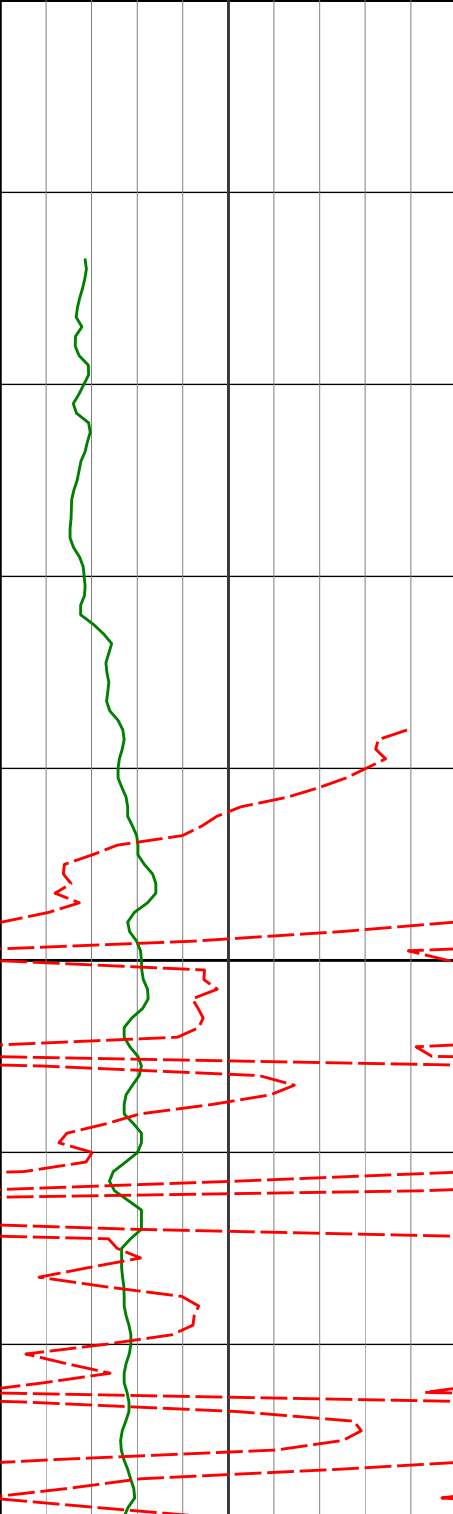


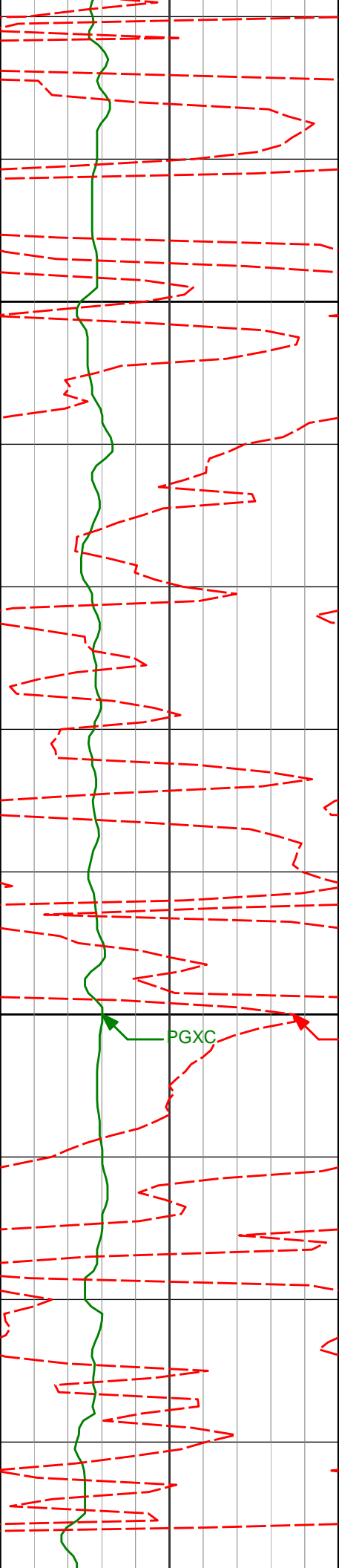






TVD Detail 1:240 Scale

PCG GR XHi-Range RT BCor PGXRC-T api								
Avg Rate of Penetration ROPA feet per hr		Depth TVD ft	Depth	Inc	Azi	TVD	V.S.	Temp
1K	0	700						92.26°F
								



900

96.42°F

96.42°F

1000

PGXC

ROPA

96.42°F

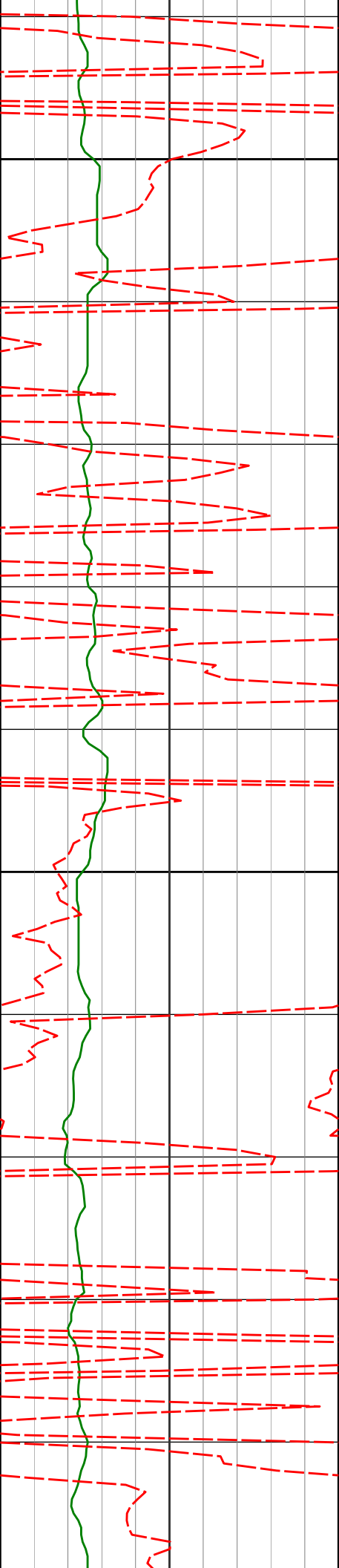
1039'

0.28°

245.39°

1038.98'

-1.99'



1100

1133'

0.35°

245.84°

1132.98'

-2.16'

1200

1234'

0.44°

270.22°

1233.98'

-2.22'

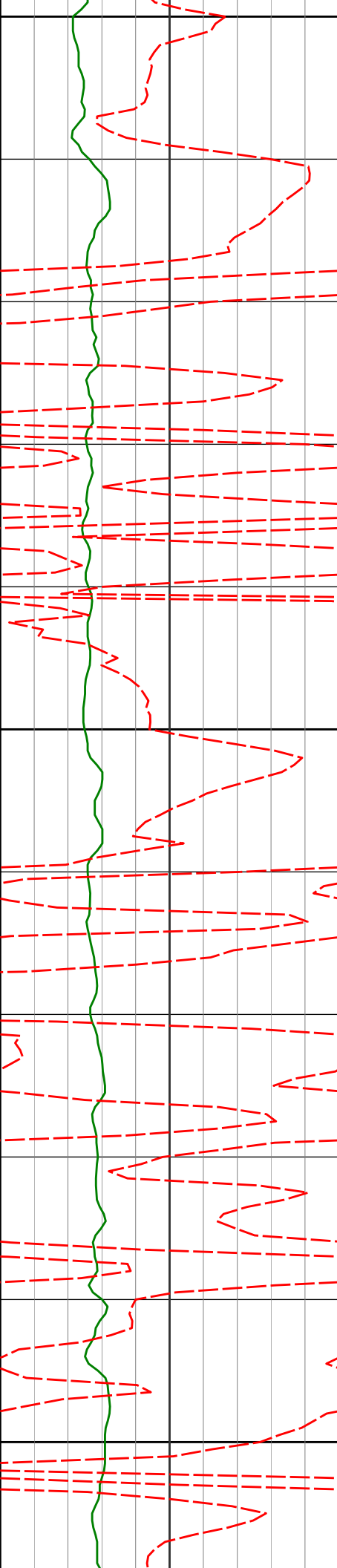
98.51°F

98.51°F

98.51°F

98.51°F

98.51°F



1300

1327'

1.76°

232.13°

1326.96'

-2.97'

98.51°F

1400

100.62°F

100.62°F

100.62°F

1500

1515'

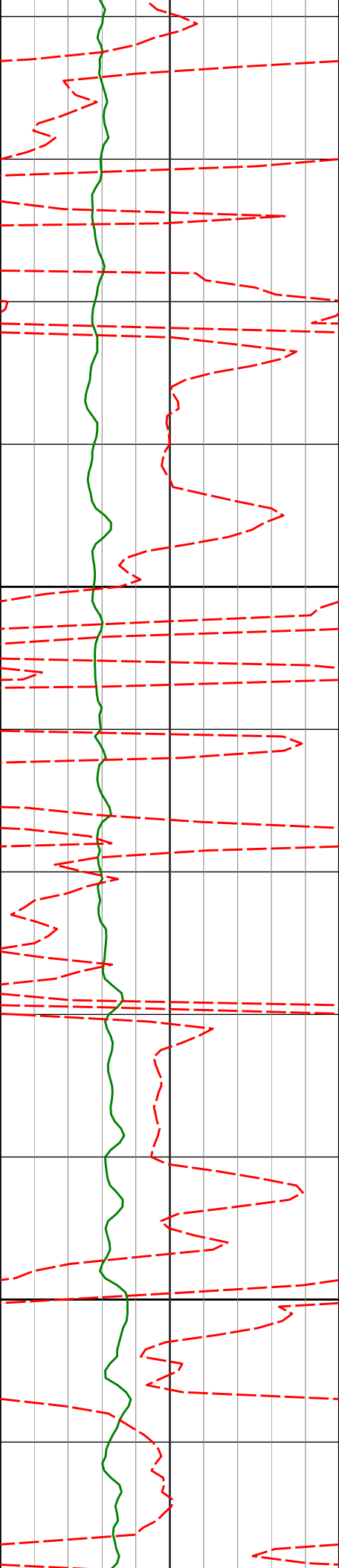
5.34°

222.06°

1514.57'

-10.48'

100.62°F



1600

1607'

7.64°

221.92°

1605.97'

-17.57'

1700

1701'

7.71°

218.36°

1699.13'

-26.42'

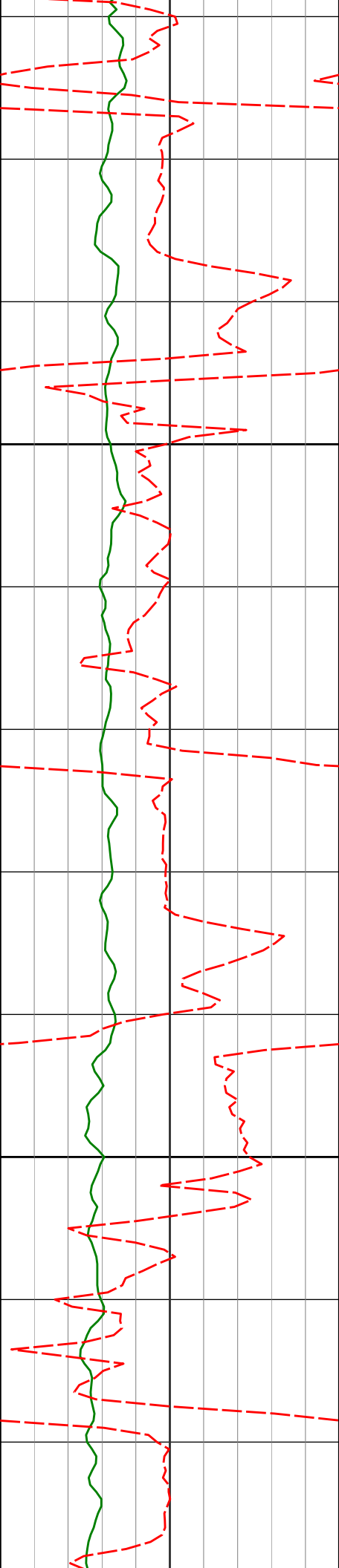
100.62°F

102.72°F

102.72°F

102.72°F

102.72°F



1800

1900

1793'

1886'

8.98°

10.52°

214.80° 1790.15'

208.21° 1881.81'

-36.42'

-49.10'

104.83°F

104.83°F

104.83°F

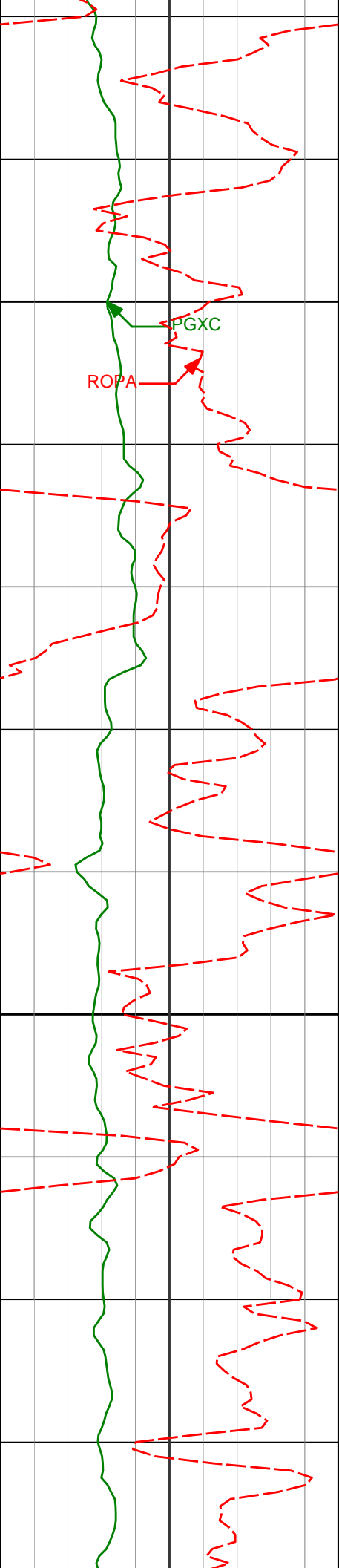
104.83°F

104.83°F

104.83°F

106.97°F

106.97°F



1979'

10.77°

206.93°

1973.21'

-63.57'

2000

PGXC

ROPA

2071'

10.67°

206.76°

2063.60'

-78.10'

2100

2163'

10.80°

205.73°

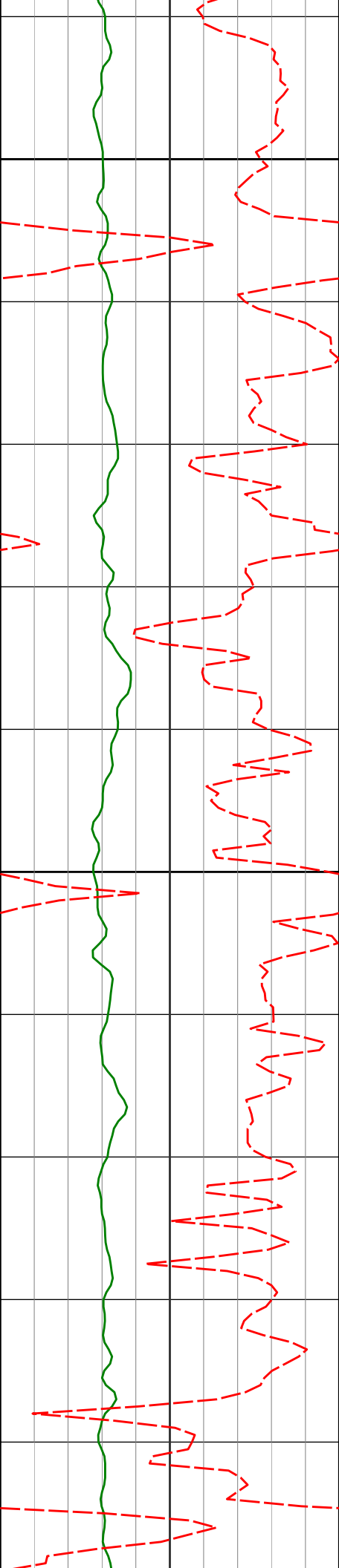
2153.99'

-92.74'

106.97°F

106.97°F

106.97°F



2200

2256'

10.55°

205.24°

2245.39'

-107.57'

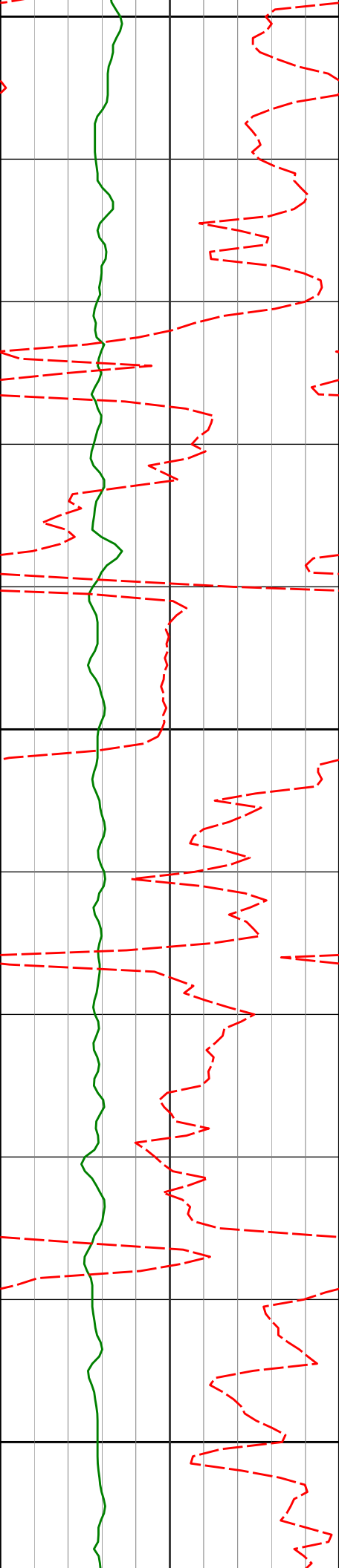
2300

109.09°F

109.09°F

109.09°F

109.09°F



2400

2441'

10.37°

205.17°

2427.31'

-136.59'

111.24°F

2500

111.24°F

111.24°F

2600

2625'

11.03°

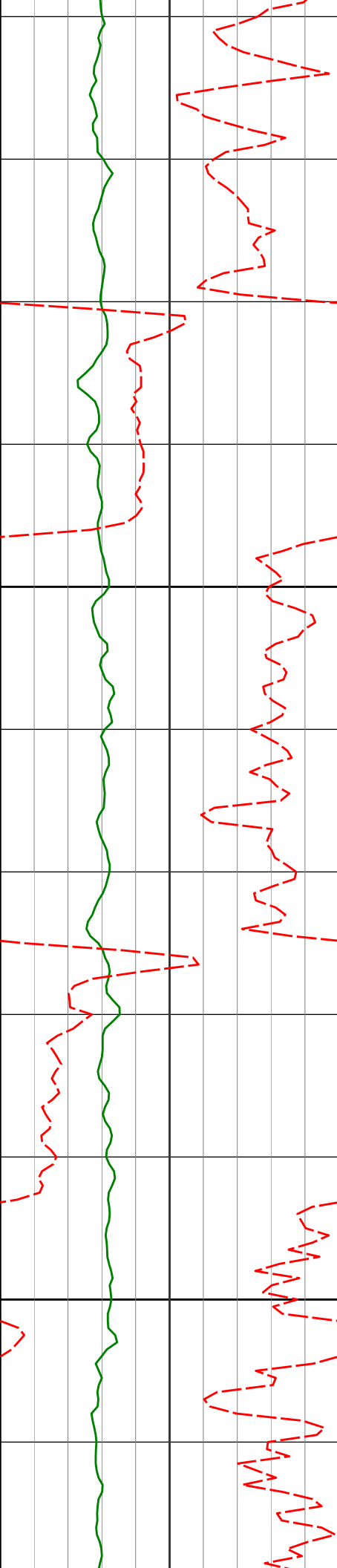
205.89°

2608.11'

-166.00'

111.24°F

111.24°F



2700

2717'

11.28°

205.41° 2698.37'

-181.30'

2800

2810'

11.22°

204.85° 2789.59'

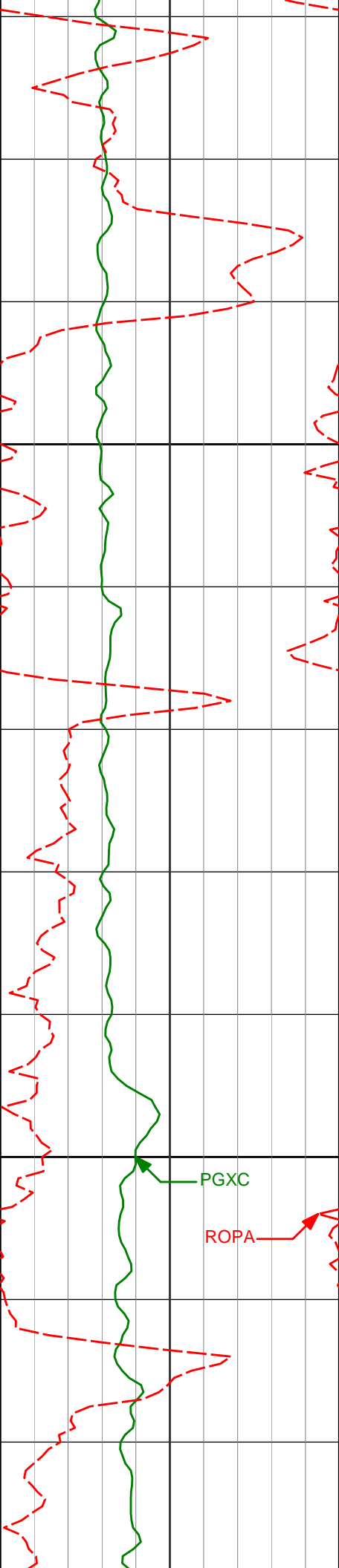
-196.98'

113.40°F

113.40°F

113.40°F

115.56°F



2903'

10.32°

211.10°

2880.95'

-211.55'

2900

115.56°F

115.56°F

115.56°F

2997'

9.85°

210.93°

2973.50'

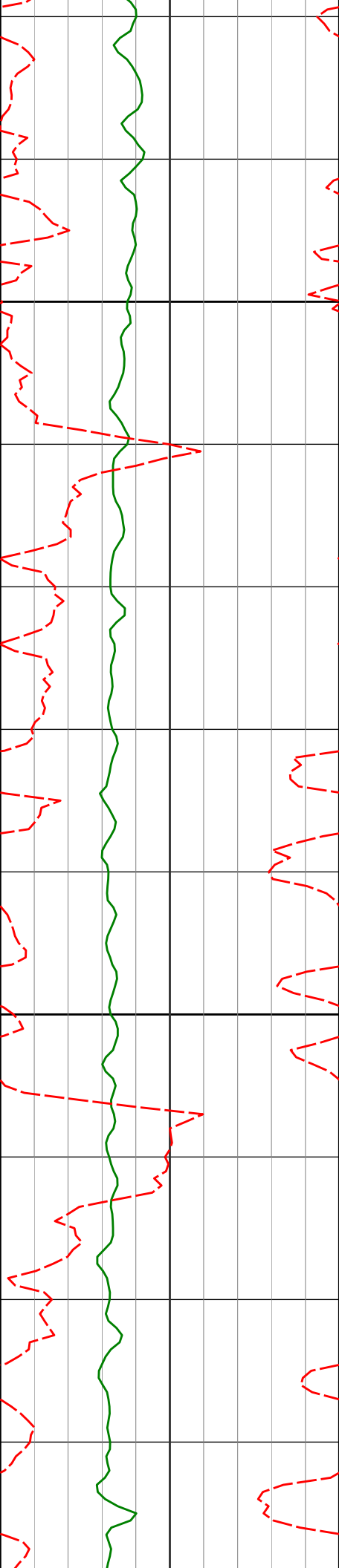
-224.86'

3000

PGXC

ROPA

117.73°F



3091'

9.47°

211.34°

3066.16'

-237.59'

117.73°F

3100

119.91°F

119.91°F

3186'

9.32°

212.39°

3159.89'

-249.99'

3200

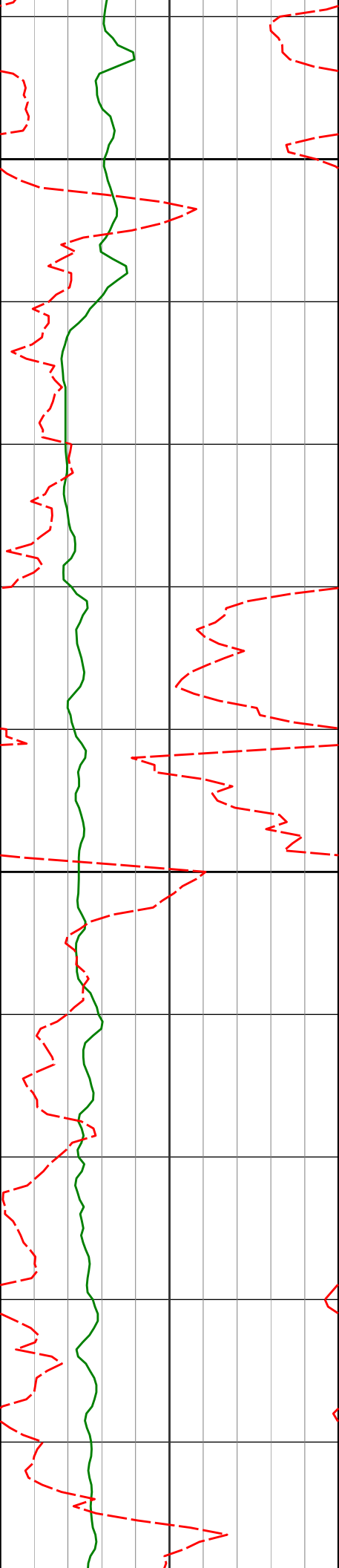
3280'

9.76°

211.63°

3252.59'

-262.43'



3300

119.91°F

3374'

10.05°

212.14°

3345.19'

-275.36'

122.11°F

3400

122.11°F

3468'

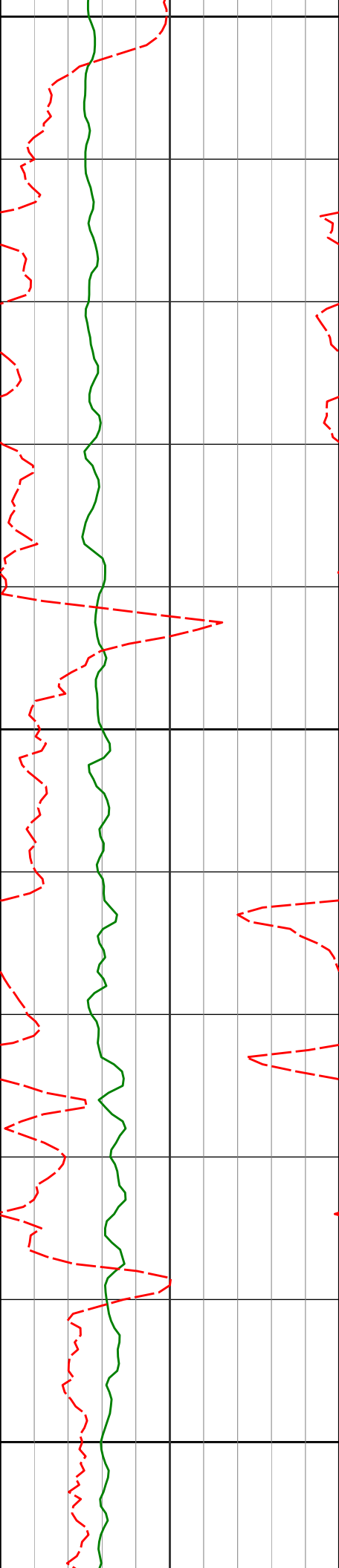
10.47°

212.04°

3437.68'

-288.71'

122.11°F



3500

3562'

10.98°

211.53°

3530.04'

-302.71'

122.11°F

3600

3656'

11.48°

212.32°

3622.24'

-317.33'

124.30°F

124.30°F

3700

3751'

11.43°

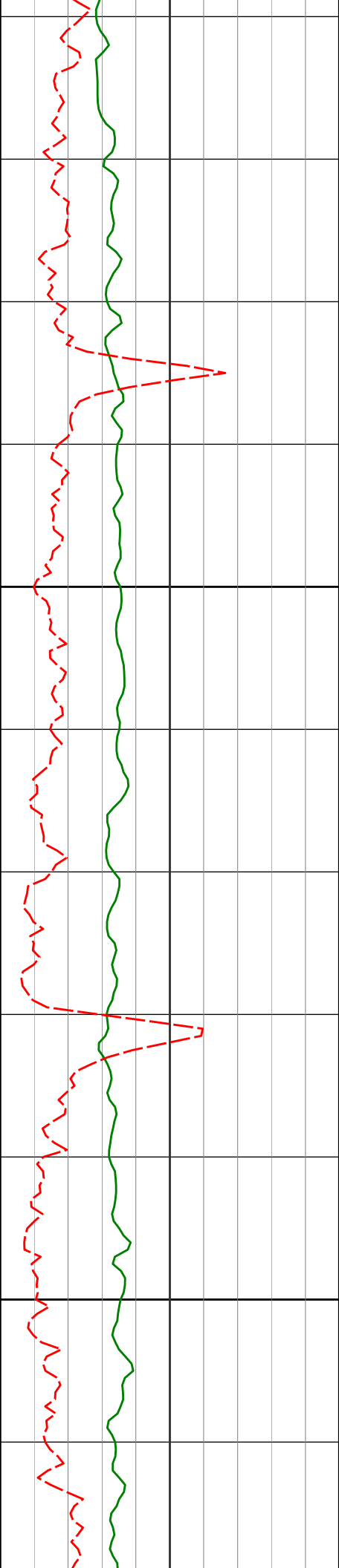
210.58°

3715.35'

-332.50'

124.30°F

124.30°F



3800

3845'

11.07°

209.73°

3807.54'

-347.48'

3900

3939'

10.35°

210.43°

3899.90'

-361.77'

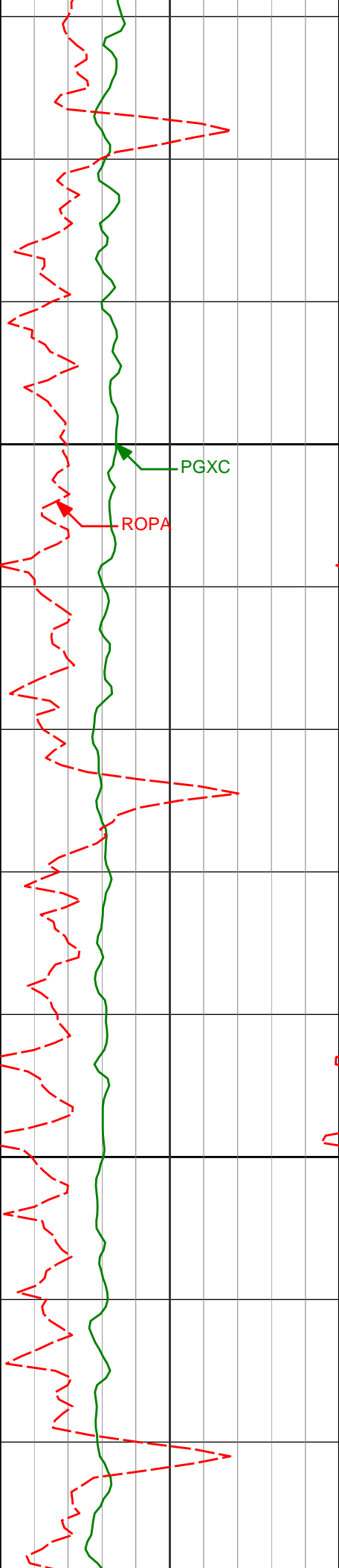
126.52°F

126.52°F

128.73°F

128.73°F

128.73°F



4000

4034'

9.76°

209.60°

3993.44'

-375.33'

128.73°F

130.96°F

130.96°F

4100

4128'

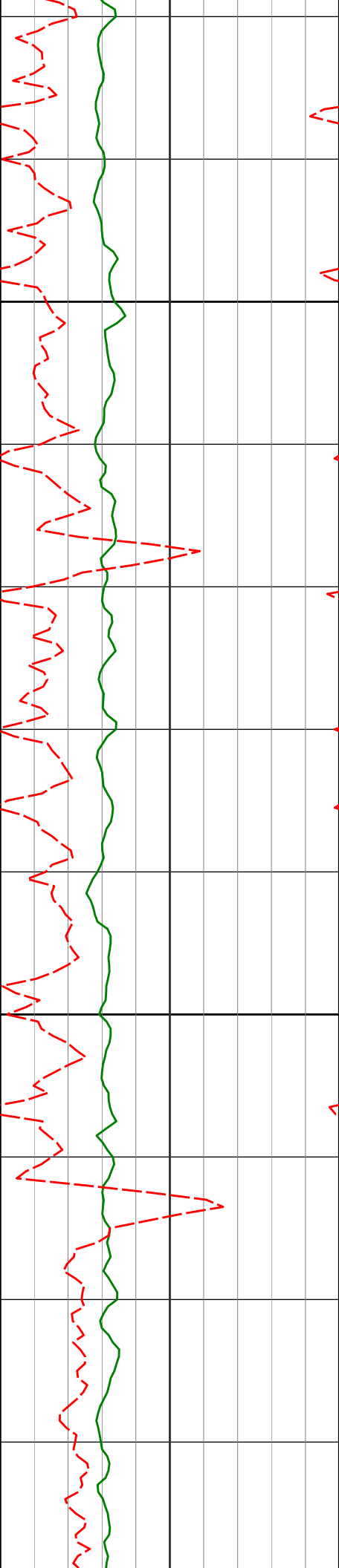
9.49°

207.71°

4086.12'

-388.40'

133.20°F



4200

4300

4222'

4316'

4411'

9.46°

9.27°

8.69°

207.40°

205.16°

202.70°

4178.84'

4271.59'

4365.42'

-401.44'

-414.50'

-427.47'

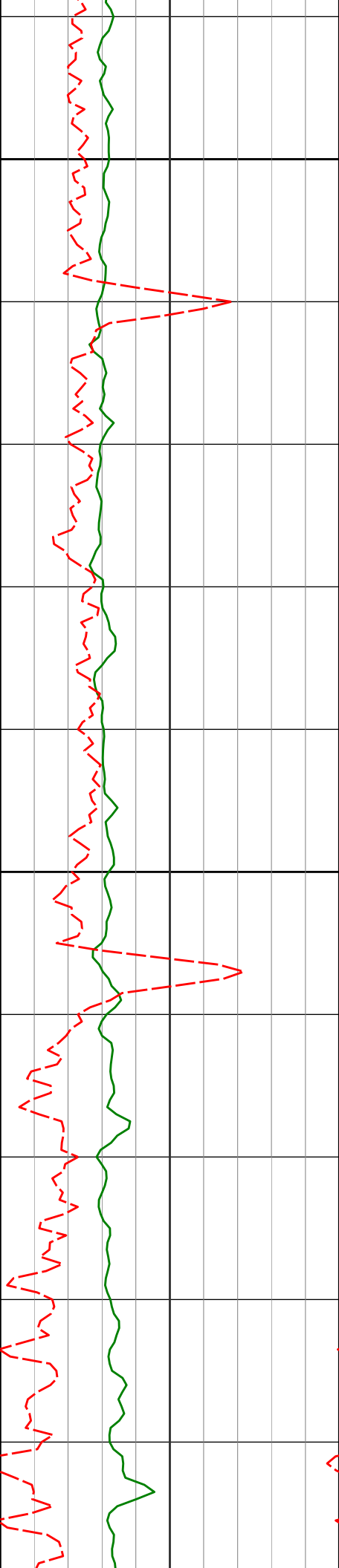
133.20°F

133.20°F

133.20°F

135.45°F

135.45°F



4400

135.45°F

135.45°F

4505'

8.31°

199.66°

4458.39'

-439.93'

4500

137.70°F

137.70°F

4599'

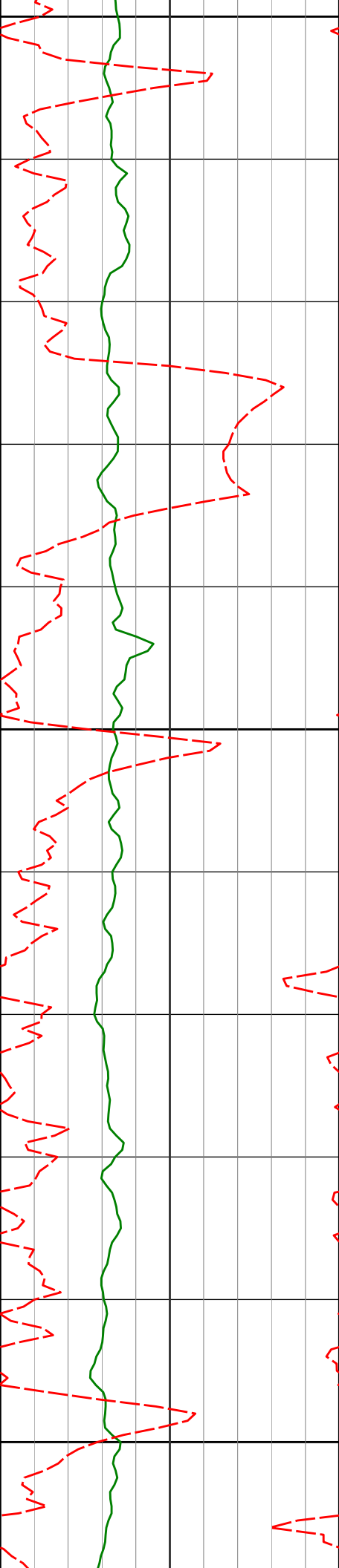
7.24°

192.45°

4551.53'

-451.75'

137.70°F



4600

137.70°F

4694'

6.15°

190.38°

4645.88'

-462.36'

139.96°F

4700

139.96°F

4788'

4.59°

202.93°

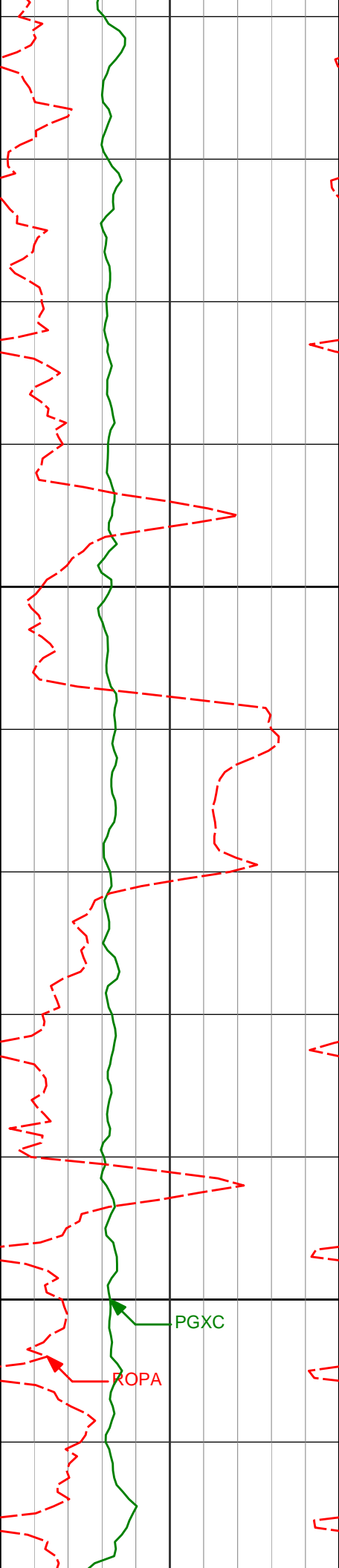
4739.47'

-470.53'

139.96°F

4800

139.96°F



4882'

4.05°

209.10° 4833.20'

-476.60'

142.25°F

142.25°F

4900

4977'

3.17°

218.11° 4928.01'

-481.29'

139.96°F

139.96°F

5000

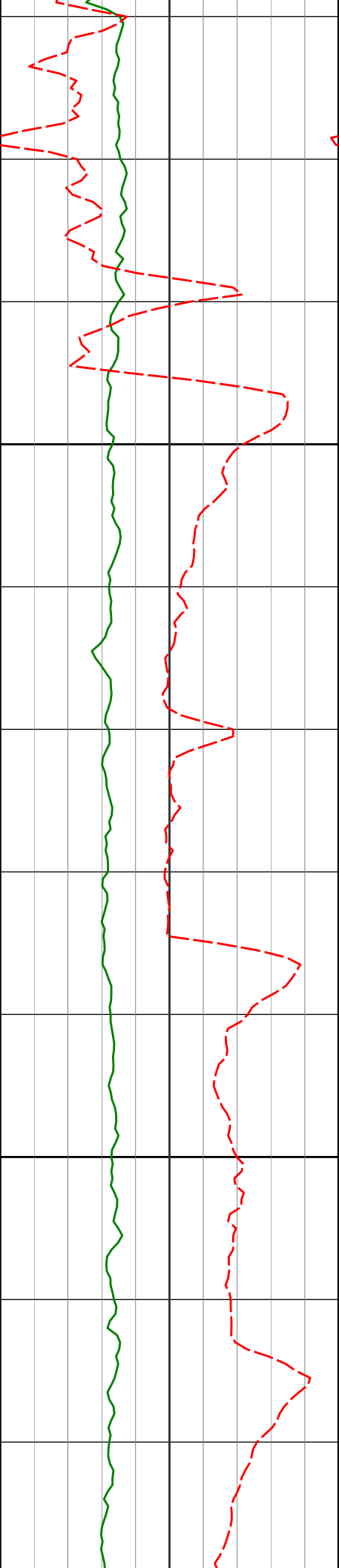
142.25°F

5071'

2.54°

219.69° 5021.89'

-484.66'



5100

5200

5166'

5260'

2.14°

13.31°

343.37°

9.87°

5116.85'

5209.87'

-484.42'

-472.21'

142.25°F

142.25°F

142.25°F

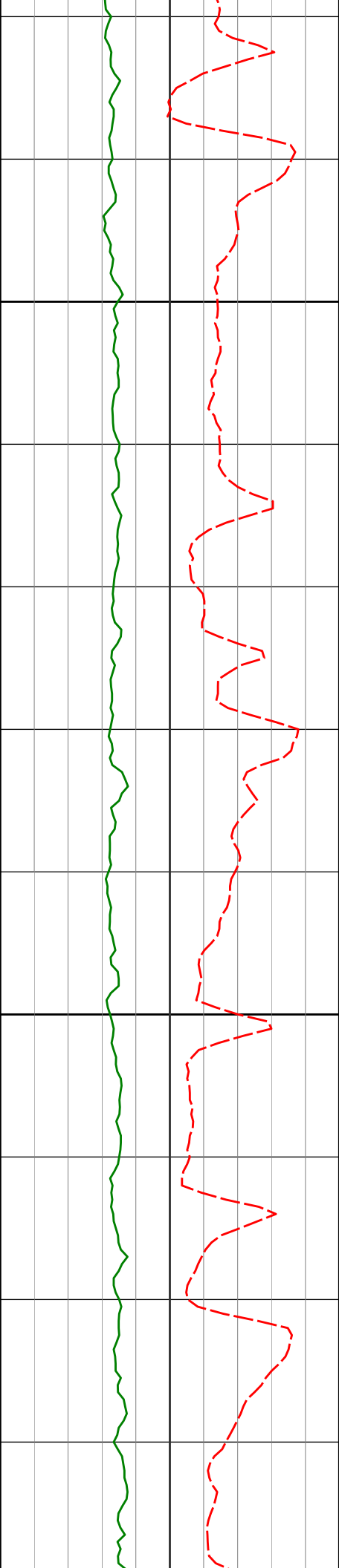
143.22°F

144.54°F

144.54°F

144.54°F

146.08°F



5300

5354'

23.74°

0.88°

5298.89'

-442.85'

146.84°F

146.84°F

147.16°F

148.76°F

5449'

31.94°

358.64°

5382.83'

-398.68'

149.36°F

5400

151.32°F

5543'

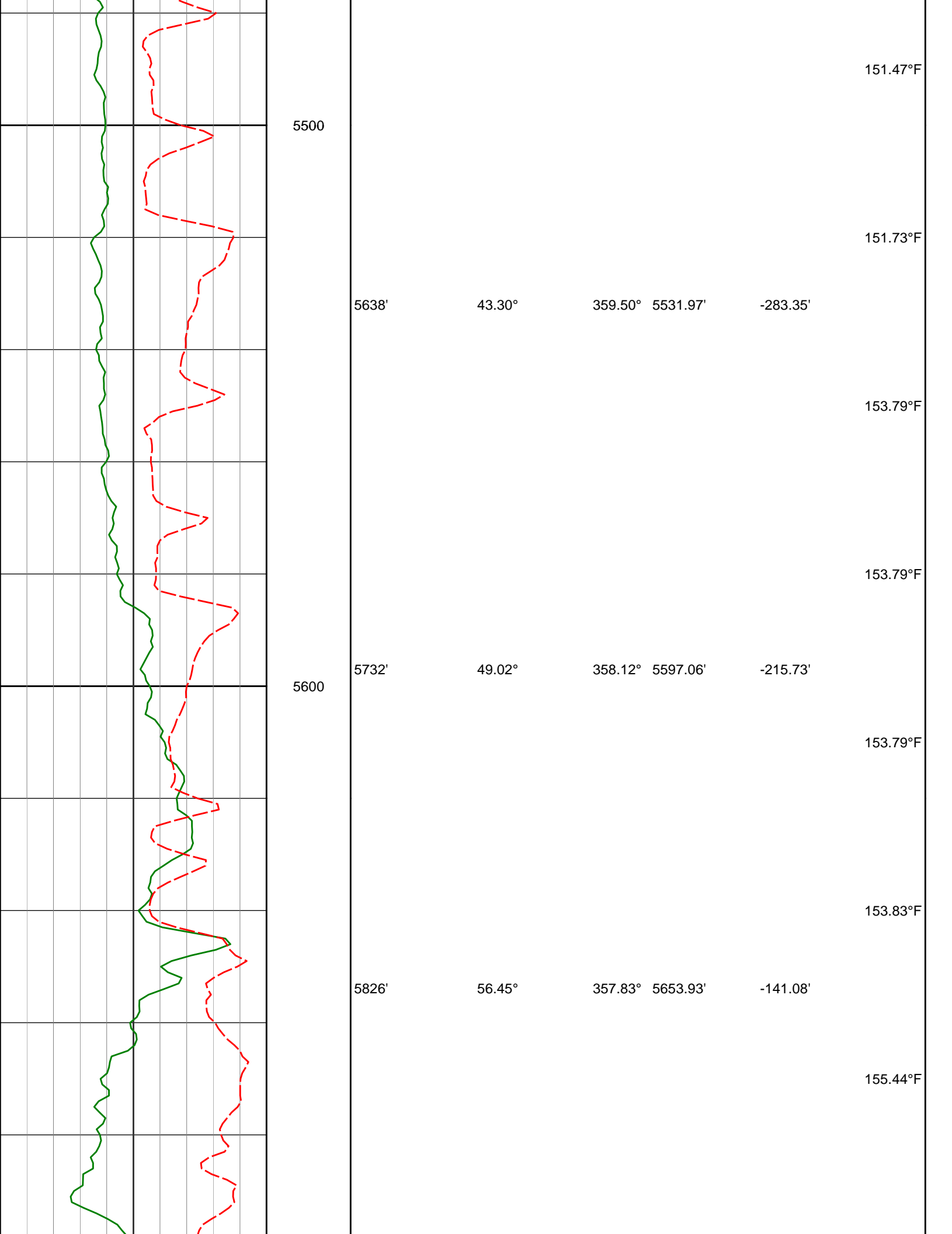
37.90°

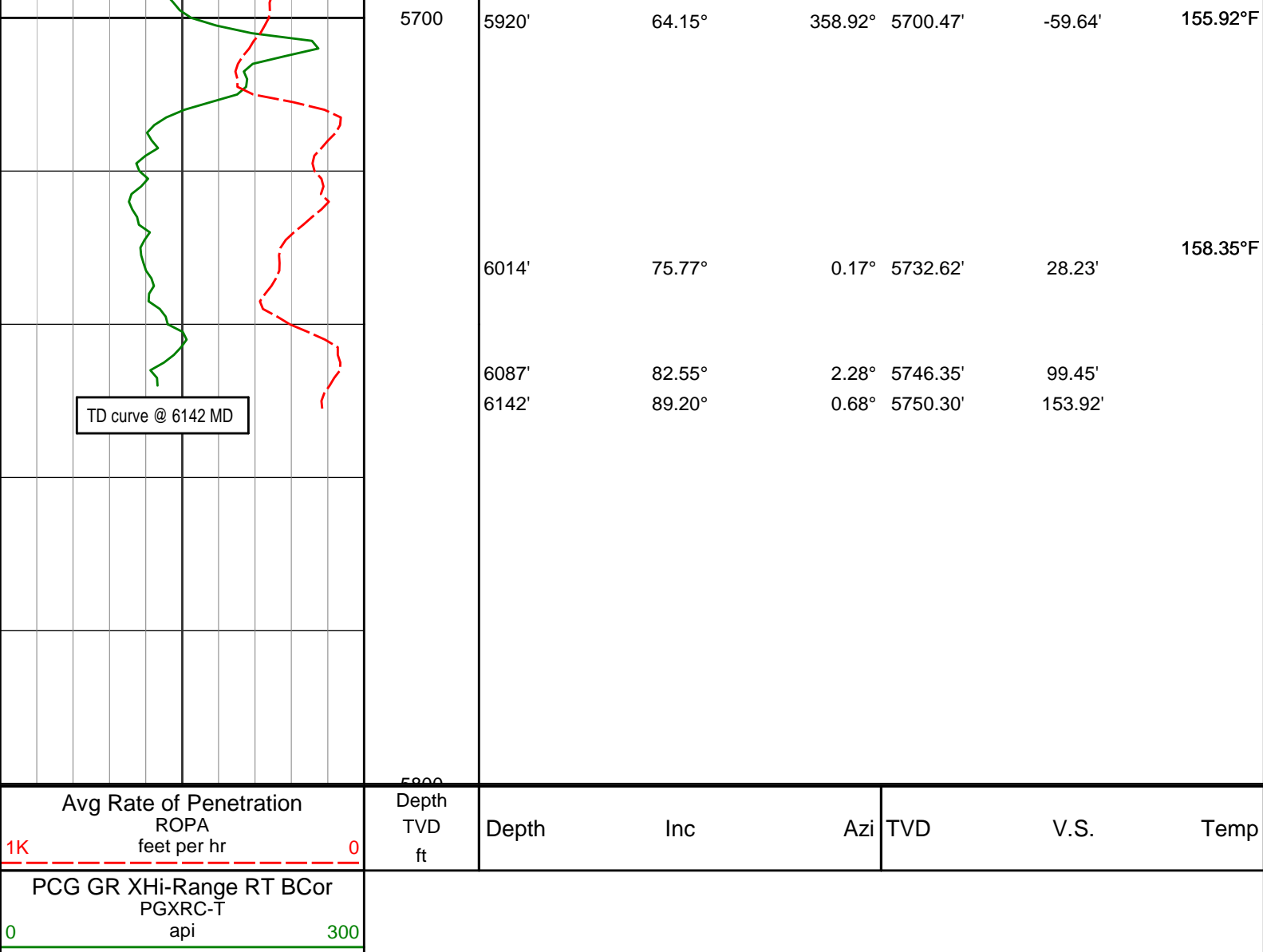
358.46°

5459.87'

-344.99'

151.47°F





HALLIBURTON

DIRECTIONAL SURVEY REPORT

Noble Energy
Gracie LD22-740
Wattenberg
Weld Colorado
USA
CA-XX-0902634324
Tied in @ Surface

Final survey projected to bit.

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
0.00	0.00	0.00	0.00	0.00 N	0.00 E	0.00	TIE-IN
795.00	0.59	247.67	794.99	1.56 S	3.80 W	-1.22	0.07
854.00	0.40	226.62	853.98	1.82 S	4.23 W	-1.44	0.44
1039.00	0.28	245.39	1038.98	2.45 S	5.11 W	-1.99	0.09
1133.00	0.35	245.84	1132.98	2.66 S	5.58 W	-2.16	0.08
1234.00	0.44	270.22	1233.98	2.79 S	6.24 W	-2.22	0.18
1327.00	1.76	232.13	1326.96	3.66 S	7.72 W	-2.97	1.55
1515.00	5.34	222.06	1514.57	11.93 S	15.86 W	-10.48	1.92
1607.00	7.64	221.92	1605.97	19.66 S	22.82 W	-17.57	2.51

1701.00	7.71	218.36	1699.13	29.25 S	30.91 W	-26.42	0.51
1793.00	8.98	214.80	1790.15	39.99 S	38.84 W	-36.42	1.49
1886.00	10.52	208.21	1881.81	53.44 S	47.00 W	-49.10	2.04
1979.00	10.77	206.93	1973.21	68.68 S	54.95 W	-63.57	0.37
2071.00	10.67	206.76	2063.60	83.94 S	62.68 W	-78.10	0.12
2163.00	10.80	205.73	2153.99	99.31 S	70.25 W	-92.74	0.25
2256.00	10.55	205.24	2245.39	114.86 S	77.67 W	-107.57	0.28
2441.00	10.37	205.17	2427.31	145.25 S	91.97 W	-136.59	0.10
2625.00	11.03	205.89	2608.11	176.07 S	106.70 W	-166.00	0.36
2717.00	11.28	205.41	2698.37	192.11 S	114.41 W	-181.30	0.29
2810.00	11.22	204.85	2789.59	208.54 S	122.11 W	-196.98	0.13
2903.00	10.32	211.10	2880.95	223.88 S	130.22 W	-211.55	1.58
2997.00	9.85	210.93	2973.50	237.99 S	138.70 W	-224.86	0.51
3091.00	9.47	211.34	3066.16	251.49 S	146.85 W	-237.59	0.40
3186.00	9.32	212.39	3159.89	264.67 S	155.04 W	-249.99	0.24
3280.00	9.76	211.63	3252.59	277.88 S	163.30 W	-262.43	0.49
3374.00	10.05	212.14	3345.19	291.61 S	171.84 W	-275.36	0.33
3468.00	10.47	212.04	3437.68	305.80 S	180.74 W	-288.71	0.45
3562.00	10.98	211.53	3530.04	320.68 S	189.95 W	-302.71	0.54
3656.00	11.48	212.32	3622.24	336.21 S	199.63 W	-317.33	0.56
3751.00	11.43	210.58	3715.35	352.30 S	209.48 W	-332.50	0.37
3845.00	11.07	209.73	3807.54	368.16 S	218.69 W	-347.48	0.42
3939.00	10.35	210.43	3899.90	383.28 S	227.44 W	-361.77	0.78
4034.00	9.76	209.60	3993.44	397.63 S	235.74 W	-375.33	0.64
4128.00	9.49	207.71	4086.12	411.41 S	243.28 W	-388.40	0.44
4222.00	9.46	207.40	4178.84	425.13 S	250.44 W	-401.44	0.06
4316.00	9.27	205.16	4271.59	438.85 S	257.21 W	-414.50	0.44
4411.00	8.69	202.70	4365.42	452.39 S	263.23 W	-427.47	0.73
4505.00	8.31	199.66	4458.39	465.35 S	268.26 W	-439.93	0.62
4599.00	7.24	192.45	4551.53	477.53 S	271.82 W	-451.75	1.54
4694.00	6.15	190.38	4645.88	488.38 S	274.03 W	-462.36	1.18
4788.00	4.59	202.93	4739.47	496.79 S	276.40 W	-470.53	2.06
4882.00	4.05	209.10	4833.20	503.15 S	279.48 W	-476.60	0.76
4977.00	3.17	218.11	4928.01	508.15 S	282.73 W	-481.29	1.10
5071.00	2.54	219.69	5021.89	511.80 S	285.66 W	-484.66	0.68
5166.00	2.14	343.37	5116.85	511.71 S	287.52 W	-484.42	4.34
5260.00	13.31	9.87	5209.87	499.34 S	286.16 W	-472.21	12.16
5354.00	23.74	0.88	5298.89	469.67 S	284.01 W	-442.85	11.48
5449.00	31.94	358.64	5382.83	425.35 S	284.32 W	-398.68	8.70
5543.00	37.90	358.46	5459.87	371.58 S	285.68 W	-344.99	6.34
5638.00	43.30	359.50	5531.97	309.79 S	286.75 W	-283.35	5.72
5732.00	49.02	358.12	5597.06	242.04 S	288.20 W	-215.73	6.18
5826.00	56.45	357.83	5653.93	167.33 S	290.85 W	-141.08	7.91
5920.00	64.15	358.92	5700.47	85.77 S	293.13 W	-59.64	8.26
6014.00	75.77	0.17	5732.62	2.38 N	293.78 W	28.23	12.42
6087.00	82.55	2.28	5746.35	74.01 N	292.23 W	99.45	9.71
6142.00	89.20	0.68	5750.30	128.82 N	290.82 W	153.92	12.43

CALCULATION BASED ON MINIMUM CURVATURE METHOD

**SURVEY COORDINATES RELATIVE TO WELL SYSTEM REFERENCE POINT
TVD VALUES GIVEN RELATIVE TO DRILLING MEASUREMENT POINT**

**VERTICAL SECTION RELATIVE TO WELL HEAD
VERTICAL SECTION IS COMPUTED ALONG A DIRECTION OF 354.95 DEGREES (GRID)
A TOTAL CORRECTION OF 6.94 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 6142.00 FEET
IS 318.08 FEET ALONG 293.89 DEGREES (GRID)**